

## Notes on Spiders of the Families Leptonetidae and Cybaeidae (Araneae) from Kumamoto Prefecture, Kyushu, Japan

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**Abstract** Three species of spiders of the families Leptonetidae and Cybaeidae from Kumamoto Prefecture, Kyushu, western Japan, are reported. A new species of the genus *Leptoneta* Simon, 1872 (Leptonetidae) is described from Dōsako, Sagara-mura, Kuma-gun, Kumamoto Prefecture, under the name of *Leptoneta higoensis* sp. nov. The spider was also found in some caves in Kuma-gun and Yatsushiro-gun of the same area. This new species seems to be closely related to *Leptoneta yamauchii* Nishikawa, 1982, known from a limestone cave in Ehime Prefecture, Shikoku, but can be distinguished from the latter mainly by the structure of male palpal organ. *Cybaeus kuramtoi* Yaginuma, 1963 and an unknown species of *Cybaeus* (Cybaeidae) are recorded based on specimens obtained from Aso-gun in northern part of Kumamoto Prefecture.

**Key words :** Araneae, Leptonetidae, Cybaeidae, cave fauna, Kumamoto, Japan

Spiders of the families Leptonetidae and Cybaeidae are soil-dwellers and are frequently found in dark and wet places as in cracks of rocks or in caves. Although they share important positions in the cave spider fauna of Japan with nesticids and some groups of pholcids and linyphiids (Komatsu, 1961), these two families stand behind the others in taxonomical studies.

During field researches made by the senior author for the last 40 years, especially on the cave fauna, three species of the family Leptonetidae and nine species of the family Cybaeidae as listed below became known from Kumamoto Prefecture, Kyushu, Japan (Komatsu, 1967, 1968a, 1968b, 1970; Irie, 1997, 1998, 2000; Irie & Ono 2000, 2001, 2002).

1, *Leptoneta iriei* Komatsu, 1967, from Tsubaki-dō Cave; 2, *Leptoneta kinoshitai* Irie, 2000, from Uchidani-dō Cave, Itsuki-mura, Kuma-gun; 3, *Leptoneta chibusana* Irie, 2000, from Chibusan-mound, Jou, Yamaga-shi; 4, *Cybaeus ashikitaensis* (Komatsu, 1968) from Ashikita-dō Cave, Ashikita-machi [distributed widely in northern Kyushu (Ihara, 2003)]; 5, *Cybaeus fiujinensis*

(Komatsu, 1968) from Fūjin-dō Cave, Mifunemachi; 6, *Cybaeus nichikoensis* (Komatsu, 1968) from Nichikō-dō Cave, Sakamoto-mura; 7, *Cybaeus takasawaensis* (Komatsu, 1970) from Takasawa-dō Cave, Kuma-mura, Kuma-gun; 8, *Cybaeus itsukiensis* Irie, 1998, from Tsuzurasedō Cave, Itsuki-mura; 9, *Cybaeus higoensis* Irie et Ono, 2000, from Takasawa-dō Cave and Kuronita-no-tateana Cave, Kuma-mura, Kuma-gun; 10, *Cybaeus kumaensis* Irie et Ono, 2001, from Itagi, Itsuki-mura, Kuma-gun; 11, *Cybaeus kawabensis* Irie et Ono 2002, from Dōsako, Sagara-mura, and Shimo-tōji, Itsuki-mura, Kuma-gun; and 12, *Cybaeus* sp. from Itagi, Itsuki-mura, Kuma-gun [= *C. uenoi* recorded by Irie & Ono, 2002; nec *C. uenoi* originally described by Yaginuma (1970) from Tsushima Island (pers. com. by Y. Ihara)].

Other than these, several unidentified species of both the families were also reported by Irie (1983, 1984, 1989, 1997). The present paper deals mainly with descriptions of two species of those unknown species. The first one is recognized as a new species of the genus *Leptoneta*

(Leptonetidae) and the second one is identified with *Cybaeus kuramotoi* Yaginuma, 1963 (Cybaeidae). This cybaeid spider was known to be distributed in Chūgoku District and in northern Kyushu (including the northern part of Kumamoto Prefecture) with remarkable geographic differentiations in genitalia, as recently reported by Ihara (2003). A further unknown species of *Cybaeus* is also reported herein.

Type specimens of the new species are deposited in the collection of the National Science Museum (Nat. Hist.), Tokyo (NSMT). Other specimens examined are preserved in the same collection or in the private collection of the senior author (T. Irie).

The abbreviations used in this paper are as follows: ALE, anterior lateral eye; AME, anterior median eye; PLE, posterior lateral eye; PME, posterior median eye; PE, posterior eye; OA, ocular area; Cp, length of elypterus; PLS, PVS, RLS, RVS, VS, positions of the spines on legs as proposed by Komatsu (1968 a).

Before going further, the authors wish to express their sincere thanks to Mr. Yoh Ihara, Hiroshima, and to Dr. Shun-ichi Uéno, Tokyo, for their invaluable adviees.

### Descriptions of the species

#### Family Leptonetidae

##### *Leptoneta higoensis* Irie et Ono, sp. nov.

[Japanese name: Higo-mashiragumo]

(Figs. 1–6)

**Diagnosis.** The present new species closely resembles *Leptoneta yamanachii* Nishikawa, 1982, described from Kuroiwa-dō Cave, a limestone eave at Tsutsumi, Mikawa-mura, Kamiukenagun, Ehime Prefecture, Shikoku, in the structure of genital organs, but is distinguishable from the latter by the shape of bulb and apical tibial apophyses of male palp and the shape of spermathecae of female genitalia. The retrolateral tibial apophysis of the new species is unique in shape, much developed and strong (Fig. 2). The basal laminar projection of bulb is apically

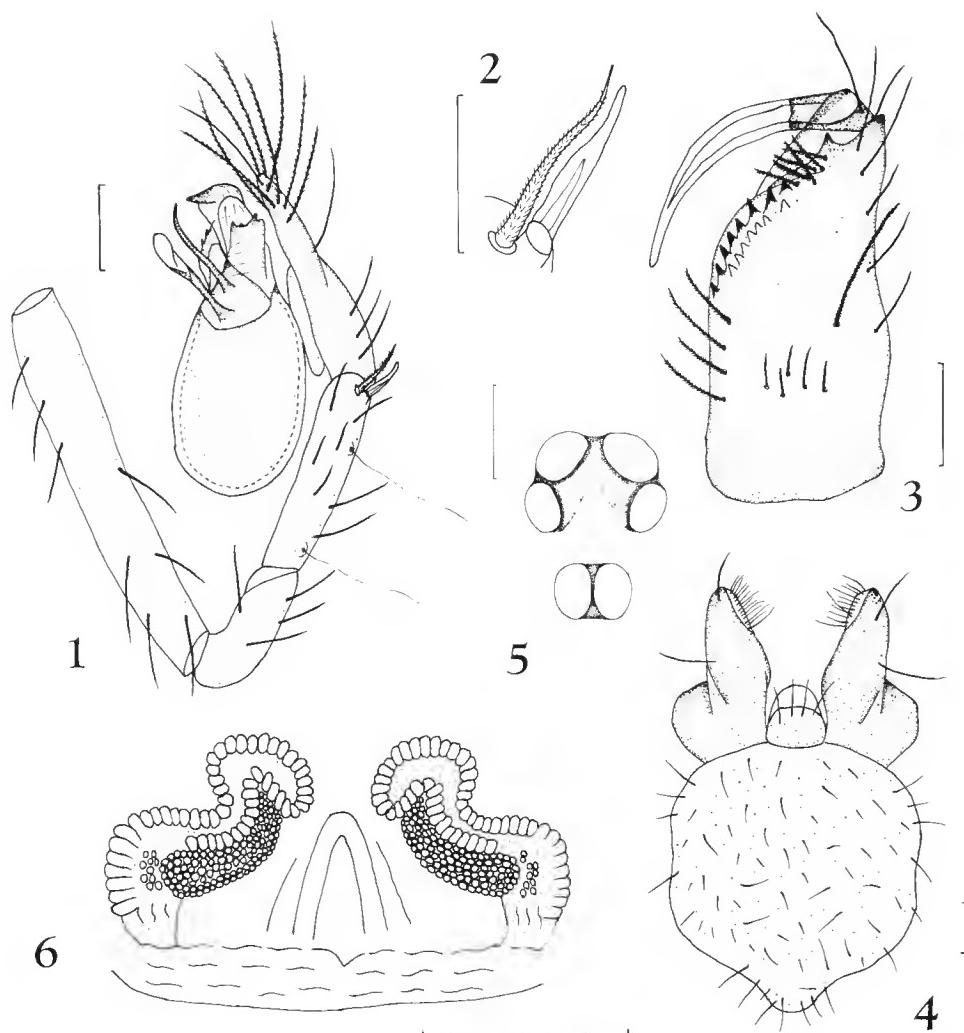
spoon-like rounded, while that is pointed in *L. yamanachii* (cf. Fig. 1 and Nishikawa, 1982, p. 79, fig. 1). Spermathecae of *L. yamanachii* are winding and much longer than those of this new species (cf. Fig. 6 and Nishikawa, p. 80, fig. 6).

**Type specimens.** Holotype: ♂, Dōsako, Sagaramura, Kuma-gun, Kumamoto Pref., Kyushu, Japan, 9–XII–2001, T. Irie leg. (NSMT-Ar 5456); paratype: ♀, Itagi, Itsuki-mura, Kuma-gun, Kumamoto Pref., 26–X–2000, T. Irie leg. (NSMT-Ar 5457).

**Other specimens examined.** 1♂2♀, same data as for the holotype; 1♂1♀, same data as for the paratype; 1♂, Niehikō-dō Cave, Sakamoto-mura, Yatsushiro-gun, 27–IX–1967; 2♂, Semeno-ana Cave, Sakamoto-mura, Yatsushiro-gun, 22–XI–1971 and 8–I–1978; 3♂3♀, Takasawa-dō Cave, Kuma-mura, Kuma-gun, 10–VI–1978 and 2–VIII–1981; 1♂1♀, Aramo-no-ana Cave, Fukada-mura, Kuma-gun, 1–XI–1978; 1♂1♀, Iri-gamo-dō Cave, Itsuki-mura, Kuma-gun, 21–III–1982; 2♂2♀, Shimo-tōjī, Itsuki-mura, Kuma-gun, 20–V–2001 and 26–X–2001; all from Kumamoto Pref. and collected by T. Irie.

**Description.** Measurements (♂ holotype/♀ paratype; in mm). Body length 1.82/1.56, carapace length 0.76/0.66, width 0.60/0.60, abdomen length 1.06/0.90, width 0.80/0.70. Lengths of legs and palps as shown in Table 1. Eyes: AME 0.06/0.06, ALE 0.06/0.06, PE 0.06/0.05; distances between eyes: ALE-ALE 0.06/0.06, ALE-PE 0.03/0.03; OA length 0.20/0.18, width 0.15/0.14, Cp 0.08/0.15.

**Male (holotype).** Carapace light yellowish brown, hairs absent. Median furrow light brown, needle-shaped, cervical grooves and radial furrows distinct and light brown. All the eyes nearly same in size; major axes of anterior lateral eyes convergent behind; posterior eyes touching one another, their axes parallel (Fig. 5). Chelicera light brown, with eight teeth on promargin of fang furrow, seven teeth on retromargin (Fig. 3). Maxillae yellowish brown, narrowing at the anterior part; labium light yellowish brown, almost as long as wide; sternum light yellowish brown, shield-shaped and almost as long as wide (Fig.



Figs. 1–6. *Leptoneta higoensis* Irie et Ono, sp. nov. 1–5, holotype ♂ (NSMT-Ar 5456), 6, a paratype ♀ (NSMT-Ar 5457). —— 1, Left palp, retrolateral view; 2, tibial apophyses of male palp, retrolateral view; 3, left chelicera, ventral view; 4, maxillae, labium and sternum, ventral view; 5, ocular area, dorsal view; 6, internal structure of female genitalia, dorsal view. (Scales: 1, 3–6, 0.1 mm; 2, 0.05 mm.)

4). Legs pale yellowish brown, leg formula 1, 4, 2, 3. Abdomen hairy, yellowish brown, oval in shape and longer than wide.

Male palp (Figs. 1–2). Femur>tarsus>tibia>patella, in length. Tibia with two long trichobothria on dorsal surface and with two apophyses on the apical part; the dorsal apophysis digitiform, sclerotized and on a basal protuberance, and the retrolateral one (seems to be derived from a hair) long, conical and furnished with minute setae. Bulb with an embolus and three laminar projec-

tions as shown in Fig. 1.

Female (paratype). Similar to male in coloration and general features. Legs shorter than those of the male. Palp longer than carapace, tarsus>tibia>femur>patella in length; femur with four dorsal and three prolateral spines; the dorsal spine in the apical part of patella 0.1 mm long.

Female genitalia (Fig. 6). Spermathecae reniform, relatively short and not winding.

*Variation.* Body-length: ♂ 1.50–2.10 mm, ♀ 1.50–1.83 mm.

Table 1. Measurements of the segments of palp and legs of *Leptoneta higoensis* Irie et Ono, sp. nov. ( $\delta$  holotype/♀ paratype; in mm).

	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Palp	0.66/0.26	0.16/0.13	0.26/0.40	—	0.30/0.46	1.38/1.25
Leg I	1.50/1.43	0.23/0.26	1.73/1.73	1.33/1.16	0.93/0.93	5.72/5.51
Leg II	1.16/1.03	0.26/0.23	1.23/1.16	0.90/0.80	0.73/0.66	4.28/3.88
Leg III	1.00/0.76	0.20/0.23	0.96/0.96	0.80/0.76	0.63/0.60	3.59/3.31
Leg IV	1.40/1.26	0.73/0.23	1.50/1.43	1.13/1.03	0.83/0.76	5.59/4.71

Table 2. Measurements of the segments of legs of *Cybaeus kuramotoi* Yaginuma, 1963, from Kumamoto Pref. (1♂1♀ from Aso-machi; in mm).

	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Leg I	2.15/1.90	0.81/0.80	1.96/1.83	1.85/1.53	1.26/1.00	8.03/7.06
Leg II	2.00/1.83	0.78/0.73	1.70/1.66	1.70/1.43	1.15/0.96	7.33/6.61
Leg III	1.85/1.66	0.67/0.70	1.45/1.36	1.63/1.40	0.93/0.80	6.53/5.92
Leg IV	2.15/1.83	0.74/0.76	1.96/1.93	2.30/2.03	0.96/0.93	8.11/7.48

*Distribution.* Kyushu (Kumamoto Pref.), Japan.

*Etymology.* The specific name is derived from Higo, an old name of Kumamoto.

*Remark.* Although many specimens of this new species were collected in the limestone caves, that is regarded as an epigean spider and appears to be trogophilous.

### Family Cybaeidae

#### *Cybaeus kuramotoui* Yaginuma, 1963

[Japanese name: Nagato-namihagumo]

(Figs. 12, 14, 16, 21–22)

*Cybaeus kuramotoui* Yaginuma, 1963, p. 57, ♀ holotype from Kōmorī-ana Cave, Akiyoshi Plateau, Yamaguchi Pref., Honshu, Japan, 13-V-1962, and 1♂ paratype from Yurino-no-ana Cave in the same area as holotype, 20-X-1962, both T. Kuramoto leg., in NSMT, types have not been returned by the original author. — Yaginuma, 1970, p. 245; 1986, p. 145; Ihara, 2003, p. 55.

*Specimens examined.* 1♂1♀, Kikuchi-keikoku Valley, Aso-machi, Aso-gun, Kumamoto Pref., Kyushu, Japan, 14-XI-2002, T. Irie leg. (NSMT-Ar 5458–5459).

*Notes.* Spiders of the genus *Cybaeus* L. Koch, 1868, do not balloon to extend their distributional range. Therefore, some species are dis-

tributed in a small area, while some have a wide range, showing complicated geographic variations. The complex of *Cybaeus kuramotoui* is an example of the latter case (Ihara, 1993, an oral presentation at the Annual Meeting of Tokyo Spider Study Group at Tokyo; Ihara, 2002, a poster presentation at the 34th Annual Meeting of the Arachnological Society of Japan at Kajiki-chō, Kagoshima). The specimens obtained from Kikuchi-keikoku (NE of Mt. Aso) in Kumamoto Prefecture were identified with this species in the widest sense under suggestion of Mr. Y. Ihara. *Cybaeus kuramotoui* was known to be distributed in Chūgoku District (Yamaguchi, Hiroshima and Shimane Prefectures) and in northern Kyushu (Fukuoka, Oita and Kumamoto Prefectures) (Ihara, 2003). A brief description based on the present specimens is given in the following lines.

*Description* [based on 1♂1♀ from Kikuchi-keikoku Valley (NSMT-Ar 5458–5459)]. Measurements (♂/♀; in mm). Body length 4.39/5.26; carapace length 2.37/2.50, width 1.74/1.66; abdomen length 2.00/2.76, width 1.48/2.46. Length of legs as shown in Table 2. Eye sizes: AME 0.08/0.08, ALE 0.13/0.13, PME 0.15/0.10, PLE 0.13/0.10. Distances between eyes: AME-AME 0.06/0.06, PME-PME 0.13/0.12, ALE-ALE 0.28/0.31, PLE-PLE 0.55/0.56. OA length

0.31/0.30, width 0.70/0.70, Cp 0.20/0.16.

Male. Carapace brown with dark radial marks, longer than wide. Row of anterior eyes straight. Chelicera brown; promargin of fang furrow with three teeth, retromargin with four teeth and five denticles. Sternum yellow, slightly longer than wide. Labium yellowish brown, almost as long as wide. Legs yellow; leg formula 4, 1, 2, 3. Spination of legs omitted. Legs with three claws: upper claw of leg I with seven teeth, that of leg IV with three teeth, lower claw of leg I with three teeth, that of leg IV with two teeth. Abdomen oval in shape, slightly longer than wide, dark gray, with paired white chevron marks.

Male palp (Figs. 12, 14, 16): Tibia short, almost as long as patella, with a retrolateral apophysis as illustrated in Fig. 14. Patella with a thumb-like apophysis furnished with 19 teeth (Fig. 12). Genital bulb globular, apical part of embolic division (without embolic cap) as shown in Fig. 16.

Female genitalia (Figs. 21–22). Epigynum with a large opening part longer than wide. The right side in ventral view with an apical element of embolus (embolic cap) of male as the mating plug (Fig. 21).

*Distribution.* Western Honshu and northern Kyushu, Japan.

### *Cybaeus* sp.

(Figs. 7–11, 13, 15, 17–20)

*Specimens examined.* 4♂, Kikuchi-keikoku Valley, Aso-machi, Aso-gun, Kumamoto Pref., Kyushu, Japan, 14–XI–2002, T. Irie leg. (1♂ NSMT-Ar 5460; others Coll. T. Irie); 8♂, Kain, Kugino-mura, Aso-gun, Kumamoto Pref., 16–X–2002, 7–XI–2002 and 8–XII–2002, T. Irie leg. (4♂, NSMT-Ar 5461–5464; others Coll. T. Irie).

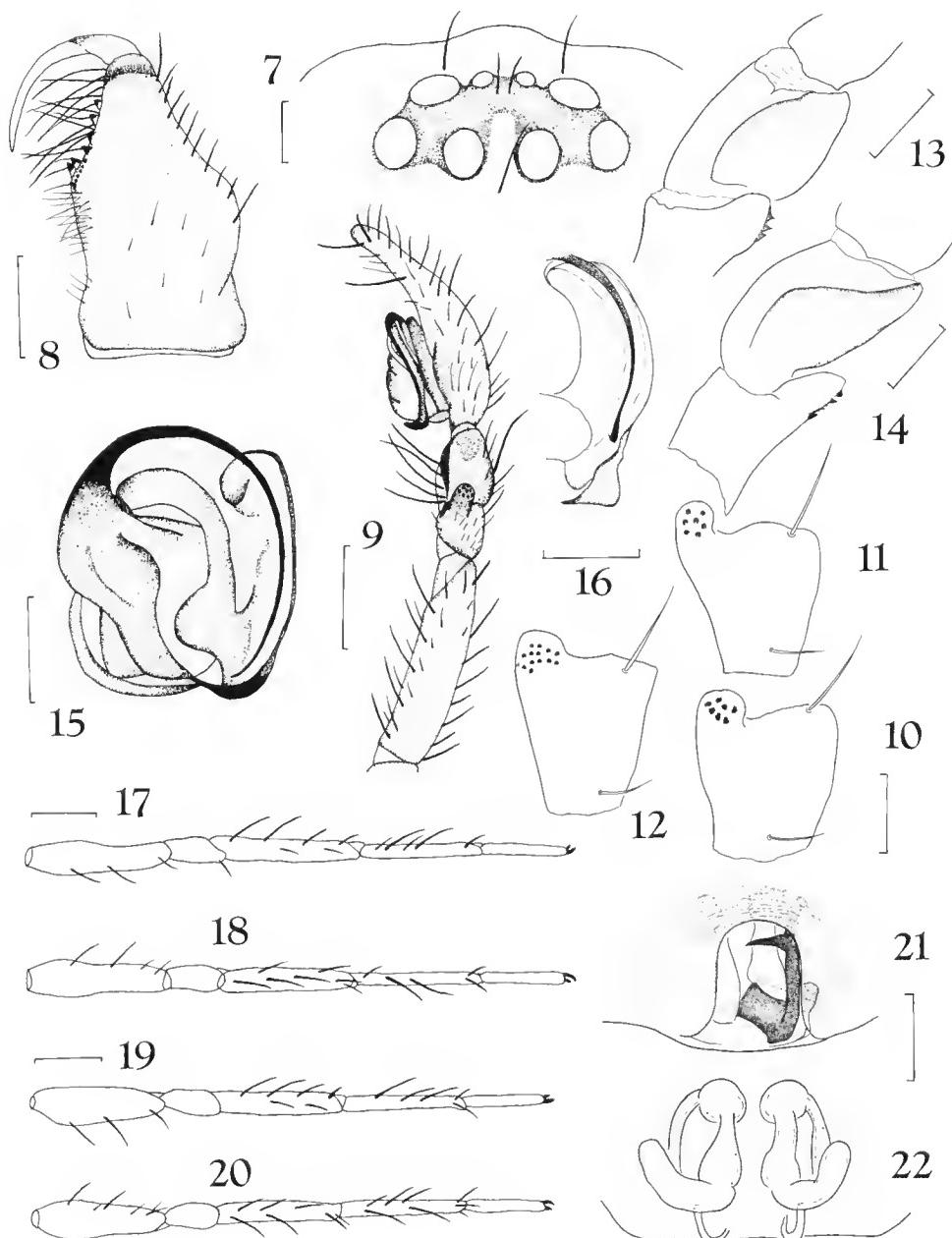
*Notes.* Males of the present material (no female was obtained from these places) closely resemble those of *Cybaeus ashikitaensis* (Komatsu, 1968), sensu Ihara (2003), as compared with specimens collected in type area (2♂2♀, between Kaiji and Uwabaru, 250 m alt., Ashikita-machi,

Ashikita-gun, Kumamoto Pref., 14–X–2001, Y. Ihara leg. et det., NSMT-Ar 5466–5467), in the structure of palpal organ, but the cymbium of the present specimens seems to be shorter than that of the specimens from Ashikita-machi. Although Ihara (2003) recorded that the number of teeth on the patellar apophysis of *Cybaeus ashikitaensis* was variable between 9 and 22, the spiders from Aso-gun have only 7 or 8 teeth on it. However, this species is left undetermined, because the female has not been obtained. In Kikuchi-keikoku Valley, this species is sympatric with *Cybaeus kuramotoi*. Besides, the type locality of *Cybaeus ashikitaensis*, a cave in Ashikita-machi, was destroyed due to quarrying.

*Description* [based on 1♂ (NSMT-Ar 5461) from Kugino-mura]. Measurements (♂; in mm). Body length 4.89 (variation of body length within the present specimens: 4.89–5.40); carapace length 2.83, width 1.83; abdomen length 2.06, width 1.60. Length of legs as shown in Table 3. Eye sizes: AME 0.06, ALE 0.13, PME 0.13, PLE 0.13. Distances between eyes: AME-AME 0.06, PME-PME 0.10, ALE-ALE 0.28. OA length 0.33, Cp 0.10.

Male. Carapace pale gray with dark gray radial marks, longer than wide. Row of anterior eyes straight (Fig. 7). Chelicera brown; promargin of fang furrow with three teeth, retromargin with four teeth and five denticles (Fig. 8). Sternum yellowish brown, slightly longer than wide. Labium yellowish brown, almost as long as wide. Legs yellow; leg formula 4, 1, 2, 3. Spination of legs (following Komatsu, 1968 a) as shown in Figs. 17–20. Tibia I with PVS1-4, PLS2-4, RVS1-4, RLS and VS. Tibia II with PVS1-4, PLS2-4, RVS1-4, RLS and VS. Metatarsus I with PVS1-3, PLS1-2, RLS1-3, RVS1-3, RVS and VS. Metatarsus II with PVS1-4, VS, RVS 1-3, RLS 1–4 and VS. Legs with three claws: upper claw of leg I with eight teeth, that of leg IV with six teeth, lower claw of leg I with three teeth, that of leg IV with two teeth. Abdomen oval in shape, slightly longer than wide, gray, with paired white chevron marks.

Male palp (Figs. 9–11, 13, 15): Tibia short, al-



Figs. 7-22. *Cybaeus* spp. from Kumamoto Prefecture. 7-11, 13, 15, 17-20, *Cybaeus* sp., 1♂ from Kain, Kugino-mura; 12, 14, 16, 21-22, *Cybaeus kuramoi* Yaginuma, 1963, 1♂ 1♀ from Kikuchi-keikoku Valley (7-10, 13, 15, 17-20, NSMT-Ar 5461; 11, NSMT-Ar 5462; 12, 14, 16, NSMT-Ar 5458; 21-22, NSMT-Ar 5459). —— 7, Ocular area, dorsal view; 8, left chelicera, ventral view; 9, left palp, retrolateral view; 10-12, patella of left palp, dorsal view; 13-14, patella and tibia of left palp, retrolateral view; 15, bulb of left palp, ventral view; 16, the apical part of embolic division of male palp, ventral view; 17, leg I, prolateral view; 18, leg I, retrolateral view; 19, leg II, prolateral view; 20, leg II, retrolateral view; 21, epigynum, ventral view with the embolic cap; 22, internal structure of genitalia, dorsal view. (Scales: 7, 10-16, 21-22, 0.2 mm; 8-9, 0.5 mm; 17-20, 1.0 mm.)

Table 3. Measurements of the segments of legs of *Cybaeus* sp. from Kumamoto Pref. (1♂ from Kugino-mura; in mm).

	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Leg I	2.20	0.83	2.10	1.86	1.13	8.29
Leg II	2.10	0.76	1.90	1.83	1.20	7.79
Leg III	1.90	0.76	1.63	1.73	1.00	7.02
Leg IV	2.26	0.83	2.16	2.46	1.16	8.87

most as long as patella, with a wide retrolateral apophysis (Fig. 13). Patella with a thumb-like apophysis furnished with seven teeth. The arrangement of teeth on the patellar apophysis is variable between individuals from a same place (cf. Figs. 10 and 11). Genital bulb globular, as shown in Fig. 15.

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